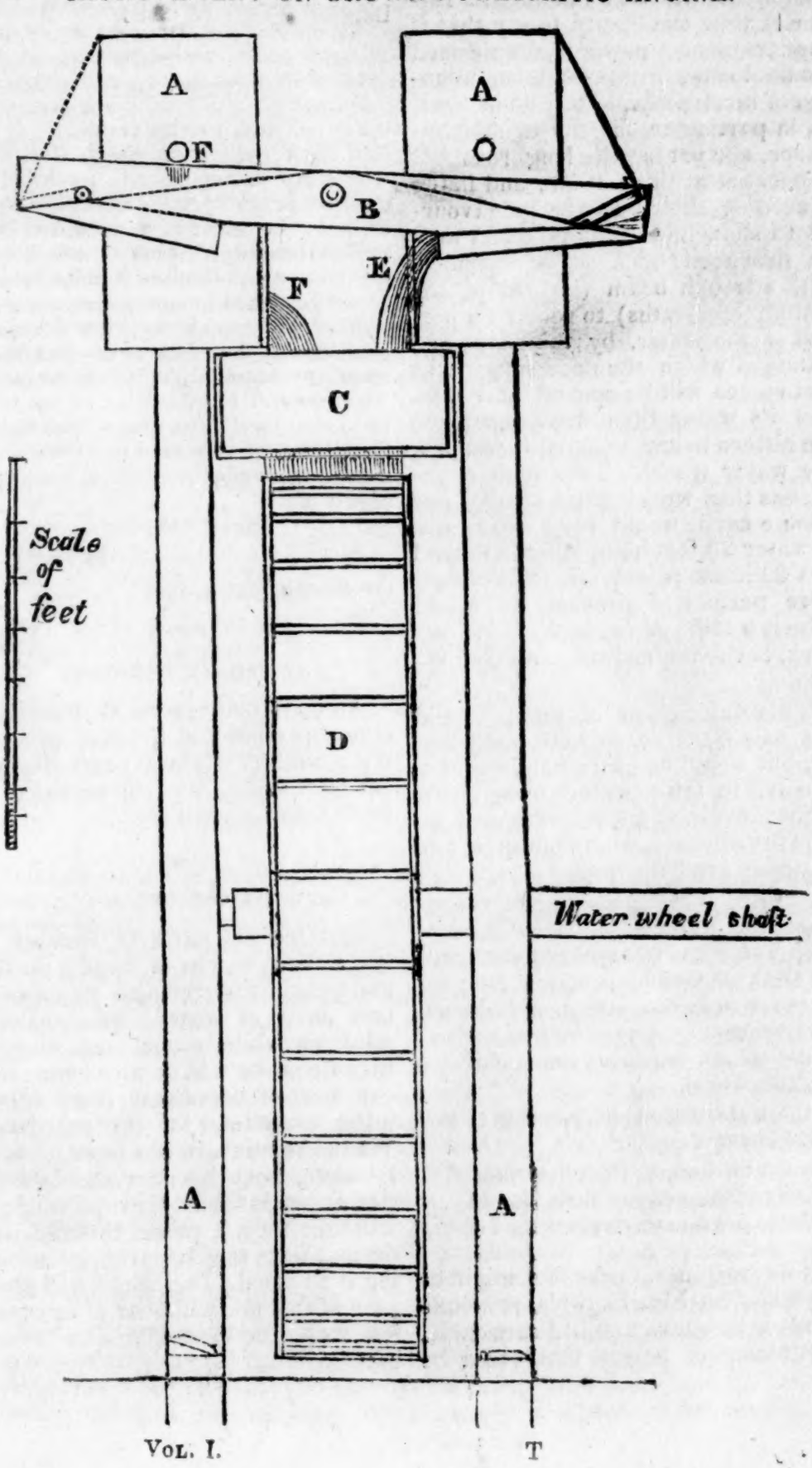
AMERICAN
MECHANICS' MAGAZINE,
Museum, Register, Journal and Gazette.

VOL. I.—No. 19.] SATURDAY, JUNE, 11, 1825. [Price $4 PER ANN

IMPROVEMENT ON BROWN'S PNEUMATIC ENGINE.



IMPROVEMENT ON BROWN'S ENGINE.

SIR,—Having seen, with pleasure, in your Mechanics' Magazine, the plan of Mr. Brown's Pneumatic Engine, I take the liberty to say that it appears to me a power so simple need not be loaded with such a complication of machinery. I see no necessity, in particular, for the double cylinder, nor yet for the long rods and apparatus at the bottom; and in the preceding sketch I have endeavoured to show how the same effect may be produced by a single cylinder, with a trough beam (instead of the bottom apparatus) to receive a portion of the water, by the rising and falling of which the necessary cocks and valves will be opened and shut, and its water then discharged into the cistern below, to assist in working the water wheel. Two such cylinders as this, working five strokes per minute each, would raise 2460 galls. of water 20 feet high, which is equal to a 30-horse power. If the vacuum were perfect, I presume it would raise it a trifle more, as 33 feet, I believe, is the highest point it could attain.

This description of pump would not only be of use to work machinery, but would be extremely useful to canals, to raise water from low to higher levels, at a small expense; also in brewhouses, where pumping and grinding are both wanted.

Description of the engravings

AAAA represent two such cylinders, with valves at bottom.

B, the trough beam, to open cocks and valves (with valves at bottom.)

C, the cistern to receive water and lay it on the wheel.

D, the water-wheel (if wanted) to turn machinery.

E, water discharging from the beam.

FF, water discharging from opposite cylinder and into the beam.

The gas-pipes, cocks, &c. might be appended on Mr. Brown's principle to set it to work, and, if practicable, any extent of power that could be wanted, for whatever purpose, might be asily obtained.

I am, Sir,
Your obedient servant,
F. FLEET.

Banbury, Sept. 14, 1824.

PURE CLAY.

SIR,—There is a stratum of clay at the Red Bluff Brickery on Mobile Bay, from which bricks, very nearly as white as the common tobacco pipes, have been burned. In common, it is mixed with sufficient sand to be worked into bricks; but there are portions of it quite as pure as any yet found in our country.

This clay is to be found on the south-east side of the creek at the Red Bluffs, about two hundred yards from its mouth. This material is difficult to be procured, and I send you this in hopes that the information may be serviceable to those engaged in manufactures which require a supply of it.

I am, Sir, Yours, &c.
ALUMINE.

Greenbush, May 4, 1825.

ARTIFICIAL PUZZOLANA.

An excellent artificial Puzzolana is now prepared in France, by heating a mixture of three parts clay and one part slaked lime, by measure, for some hours, to redness.

IMITATION CHINA INK.

Dissolve six parts of isinglass in twice their weight of boiling water; and one part of Spanish liquorice in two parts of water. Mix the two solutions while warm, and incorporate them, by a little at a time, with one part of the finest ivory black, using a spatula for the purpose.—When the mixture has been perfectly made, heat it in a water-bath till the water is nearly evaporated; it will then form a paste, to which any desired form may be given, by moulding it as usual. The colour and goodness of this ink will bear a comparison with the best China or Indian ink.

SECURITY OF STEAM ENGINES.

The Royal Academy of Paris has been called upon by the government to report on the means proper to be adopted for the prevention of accidents and injury from the explosion of steam engine boilers.—The means proposed had the double object of preventing the rupture of the boilers; or, in case of their destruction, prventing injury to neighbouring buildings. They directed that the boiler should be proved by the hydraulic press, with a force five times that which they would have to bear during the working of the engines; that a safety-valve should be attached to the boiler, and locked up; the valve being so loaded as to open at a pressure just above that by which the boilers have been tried; that the boiler should be surrounded by a wall of masonry one metre (39.371 inches) in thickness; an interval of a metre being left between the boiler and the wall, and again between the wall and the neighbouring buildings. Another precaution has been added by M. Dupin (whom we congratulate on his deserved elevation to the rank of Baron) and adopted by the Academy; namely, the introduction of a metallic plug into the upper surface of the boilers, formed of such an alloy as should melt at a temperature a few degrees above that at which the engine is intended to work.

In consequence of this application, it became necessary to form a table of the pressure and temperature of vapour. The Academy appear very doubtful of estimations as yet published, but give the following table, up to eight atmospheres, as nearly correct: above that, they say, it was impossible to go without farther experiments.

Elasticity in atmospheres.	Height of Mercury.		Temperature of Fah.	Pressure on a square inch.
1	29.92	in	212°.0	14.61 lbs. avoir.
1½	44.88		234.0	21.92
2	59.84		251.6	29.23
2½	74.80		264.2	36.44
3	89.76		275.0	43.84
3½	94.73		285.3	51.15
4	119.69		293.4	58.46
4½	134.65		302.0	65.76
5	149.61		309.2	73.07
5½	164.57		316.4	80.37
6	179.53		322.7	87.69
6½	194.49		328.5	94.99
7	209.45		334.4	102.30
7½	224.41		339.3	109.60
8	239.37		343.4	116.92

It is advised that no direction should be given for the composition of the fusible plugs or plates, but their preparation entrusted to some competent person, who should be responsible for the accuracy of their fusing points. The fittest place for them, all things being considered, is the upper surface of the boiler. Their proper diameter and thickness have not yet been ascertained; they should be such as to bear the force of the vapour without risk of breaking, and, when the plate is fused, to leave an aperutre sufficient for the ready escape of the vapour.—*Ann. de Chimie*, xxvii. 95.

DYEING IVORY SCARLET.

Sir,—In answer to your Correspondent's inquiry, in the Mechanics' Magazine, I beg to hand you the following Receipt for Staining Ivory Scarlet, which I have used for many years with invariable success; and which, with slight alterations in the quantities of the substances employed, will produce on ivory all the different hues between the pale orange and the dark ruby or purple.

The ivory must first be highly polished in the usual way, with soap and water and powdered chalk, on a linen rag, and rubbed dry with a soft linen cloth.

To make the dye, take half an ounce of the best cochineal, and two drachms of cream of tartar, and a bit of alum about the size of a nut; grind the cochineal and alum to a moderately fine powder in a glass or Wedgewood mortar, mix the cream of tartar with them, and tie them up loosely in a piece of fine muslin; put

this little bag into a common white basin, with a *large* pint of soft water, and immerse the basin in a saucepan, or other convenient vessel, full of water, so as to form a bath, and set it on the fire to boil; then steep the ivory for 30 or 40 seconds in dilute nitric acid, of such a strength as to be rather unpleasantly acid to the taste; wash it well for five or six minutes in clean water, stirring it all the time with a wooden spoon; then, with the spoon, or a pair of wooden pliers, put it immediately into the basin containing the dye-liquor, taking particular care not to touch it with the fingers. As soon as the liquor becomes hot, the colour (which will now be a crimson or ruby colour) will strike into the ivory To render this colour scarlet, have ready a saturated solution of tin in strong nitro-muriatic acid, which must be cautiously dropt into the dyeing liquor, until the colour becomes such as may be desired.* If too much of the solution of tin † be added, it will produce an orange or almost yellow colour; but the scarlet or ruby hue may be again restored at pleasure, by adding a few drops of the carbonate of potash (salt of tartar of the shops) dissolved in water. When such a colour is obtained as may be wished, the work must be taken from the liquor with the spoon or pliers, and rolled up in a clean cloth until cold, to prevent splitting; when cold, it may be polished with a hard toothbrush, next with a brush a little softer, and the smallest possible quantity of sweet oil.

I am, sir, yours, &c.

AN AMATEUR TURNER.

Norwich.

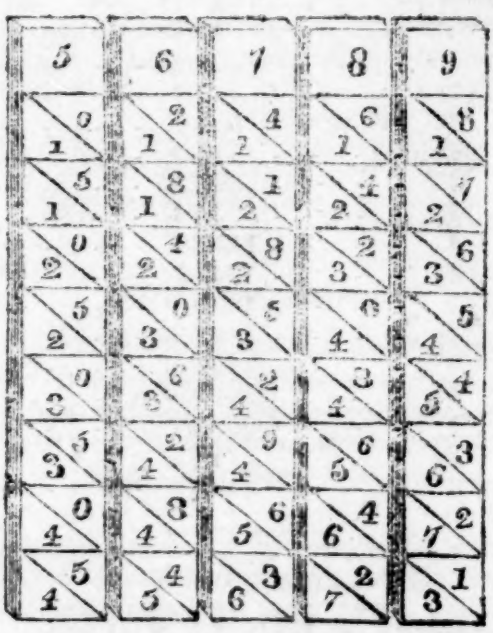
NEW ALARUM.

Among the recent inventions of our clever neighbours, the French, is an alarum, which is perfectly unconnected with a watch, but which answers all the purposes of an alarum watch, and is ten times louder. In this invention the watch is set upon the frame of the alarum, and is connected with the index of the latter by means of a key which is fixed upon the handles of the watch, and which turns round and discharges the alarum at the hour marked by the person who sets it. The great merit of this invention is its simplicity and its cheapness. The price in Paris is only 30 francs, and it is really an elegant little article.

Mechanics' Register.

NAPIER'S BONES.

Fig. 1.



The rods known by the name of Napier's Rods, or Bones, were contrived by Lord Napier for the more easy performing of the arithmetical operations of multiplication, division, &c. &c. These rods are five in number, made of bone, ivory, horn, wood, or pasteboard, &c. Their faces are divided into nine little squares, each of which (see figs. 1 and 3) is parted into two triangles by diagonals. In these little squares are written the numbers of the multiplication table, in such manner as that the units, or right-hand figures, are found in the right-hand triangle, and the tens, or the left-hand figures in the left-hand triangle.

To multiply numbers by Napier's bones, dispose the rods in such a manner as that

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* It is a good plan to keep a bit of fine scarlet cloth to compare your work with, in order to insure having a good colour.

† Any chemist will make the solution of tin in the nitro-muriatic acid; but it must be made with the strongest nitric, not nitrous acid, and it must be perfectly saturated.

the top figures may exhibit the multiplicand, and to those on the left hand join the rod of units, in which seek the right hand figure of the multiplier, and the numbers corresponding to it, in the squares of the other rods; write out, by adding the several numbers occurring in the same rhomb together and their sums. After the same manner write out the numbers corresponding to the other figures of the multiplier, disposing them under one another as in common multiplication; and, lastly, add the several numbers into one sum. For example, suppose the multiplicand 5978, and the multiplier 937.

```
 5978
  937
 ----
41846
17934
53802
-----
5601386
```

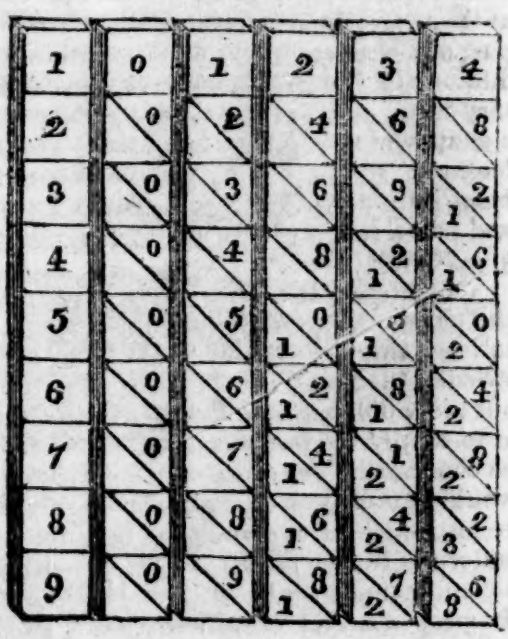
Fig. 2.

From the outermost triangle (fig. 2) which corresponds to the right-hand figure of the multiplier 7, write out the figure 6, placing it under the line. In the next rhomb towards the left, add 9 and 5; their sum being 14, write the right hand figure 4 against 6, carrying the left hand figure 1 to 4 and 3, which are found in the next rhomb; join the sum 8 to 46, already set down. After the same manner, in the next rhomb, add 6 and 5, and the latter figure of the sum, 11; set down as before, and carry 1 to the 3 found in the left hand triangle; the sum 4 join, as before, on the left hand of 1846: thus you will have 41846 for the product of 5978 by 7. And in the same manner are to be found the products for the other figures of the multiplier, after which the whole is to be added together as usual.

To perform division, dispose the rods so that the uppermost figures may exhibit the divisor; to those on the left hand join the rod of units; descend, under the divisor, till you meet those figures of the dividend in which it is first required how oft the divisor is found, or at least the next number which is to be subtracted from the dividend; then the number corresponding to this in the place of units, set down for a quotient; and, by determining the other parts of the quotient in the same manner, the division will be completed. For example, suppose the dividend 5601386, and the divisor 5978.

```
5978)5601386(937
  53802
  -----
  22118
  17934
  -----
  41846
  41846
```

Fig. 3.



Since it is first required how oft 5978 is found in 56013, descend under the (fig. 2) divisor till, in the lowest series, you find the number 53802 approaching nearest to 56013, the former of which is to be subtracted from the latter, and the figure 9 corresponding to it in the rod of units set down for the quotient. To the remainder,

2211, join the following figure, 8, of the dividend; and the number 17934 being found, as before, for the next less number to it, the corresponding number 3 in the rod of units is to be set down for the next figure of the quotient. After the same manner the third and last figure of the quotient will be found to be 7, and the whole quotient 937.

GAS LIGHTS FOR SHIPS.

Sir,—The frequent accidents which happen at sea and on our coasts, in dark and foggy weather, induce me to hazard the question, Whether it be not practicable, and without any degree of coercion, as it would be attended with very great advantages to all concerned, unaccompanied with expense or trouble, to establish a system of lighting up ships, after the manner of street night lamps, in all cases whenever it may be dangerously dark, and their situation is liable to accident or to be productive of injury. Two lanterns to each ship, under such circumstances, might be the means of saving many a ship and cargo, and many valuable lives, particularly when troops are on board. It may probably be the case that lights for this purpose are frequently hoisted; but, as there may be no established law for the purpose, coasters may be unprepared or dilatory in the performance of this necessary duty, and hence the many serious accidents which happen. Lights and a good look out would not only prevent vessels being run down, but show where buoys and hawsers lie, which have been so frequently fatal to craft.

The introduction of even gas lights into the navy is far from being impracticable; In large ships, the galley could be so constructed that gas might be made throughout the whole night or day if required, so as to supply the burners as fast as it could be consumed. Refining and a gasometer would be unnecessary, and the flame might be projected by a cylindrical or globular lantern of talc or horn. I foresee neither difficulty, inconvenience, nor trouble, in the proposal, and only wish some good may arise from these loose hints, which others, I hope, will improve upon, and which, if feasible, the underwriters have every means of having carried into practice.

Your constant reader,

C. D. Y.

NEW MODE OF EMBOSSING DESIGNS ON WOOD.

By Mr. John Starker, of Red Cross Square, Cripplegate.

Raised figures on wood, such as are employed in picture frames and other articles of ornamental cabinet work, are produced by means of carving, or by casting the pattern in Paris plaister, or other composition, and cementing or otherwise fixing it on the surface of the wood. The former mode is expensive; the latter is inapplicable on many occasions.

The invention of Mr. Starker may be used either by itself or in aid of carving, and depends on the fact, that if a depression be made by a blunt instrument on the surface of wood, such depressed part will again rise to its original level by subsequent immersion in water.

The wood to be ornamented having first been worked out to its proposed shape, is in a state to receive the drawing of the pattern: this being put in, a blunt steel tool, or burnisher, or die, is to be applied successively to all those parts of the pattern intended to be in relief, and at the same time is driven very cautiously, without breaking the grain of the wood, till the depth of the depression is equal to the subsequent prominence of the figures. The ground is then to be reduced, by planing or filing, to the level of the depressed part; after which, the piece of wood being placed in water, either hot or cold, the parts previously depressed will rise to their former height, and will thus form an embossed pattern, which may be finished by the usual operations of carving.

UNIVERSAL STANDARD.

Sir,—Mr. Pasley suggests a universal standard for our weights and measures; but I do not agree with him in thinking that the distance which a body falls in a second of time would be more accurate than the lengths of the pendulum vibrating seconds at any proposed latitude.—Certes, the point of suspension of the pendulum can be as accurately determined as the point from whence any body falls by the free action of gravity. The experiments of Galileo, who is justly and universally allowed to be the father of this branch of physical science, and the subsequent researches of Huyghens, have shown that falling bodies and vibrating pendulums are variable at different latitudes, and they have also shown that this

variation arise sfrom the peculiar figure of the earth; so that before we attempt to discover a true standard from the theory of falling bodies, the figure of the earth ought to be the first object of our inquiry. But here we are not left without a witness. The labours of Maupertuis and others have determined it so far as almost to bid defiance to farther human ingenuity on the subject.

J. Y.

ROPE BRIDGES.

In India there are bridges called Portable Rustic Rope Bridges of Tension and Suspension, and they are exactly what the name describes. A few hackeries will carry the whole materials, and the appearance of the bridge is rustic and picturesque. They are distinctly bridges of tension and suspension, having no support whatever between the extreme points of suspension, independent of the standard piles, which are placed about fifteen feet from the banks of the river, except what they derive from the tension, which is obtained by means of purchases applied to a most ingenious combination of tarred coir ropes of various sizes, lessenning as they approach the centre. These form the foundation for the pathway, and are overlaid with a light split bamboo frame work. The whole of this part of the fabric is a fine specimen of ingenuity and mathematical application. One great advantage it possesses is, that if by any accident one of the ropes should break, it might be replaced in a quarter of an hour without any injury to the bridge. It is impossible, in this article, to give so particular a description as to render its minute parts clear, nor in fact can any description do so, unaccompanied by the plan.

The chief principle of its construction is, the perpendicular action of its weight; a principle obviously of paramount necessity in India, where the soil is so loose, and offers so little resistance, and more particularly in relation to the specific purpose for which they were invented. The whole weight of the bridge, therefore, resting on two single points, so far separated, and unassisted either by pier head or abutment, rendered its construction a matter of extreme delicacy, and it has been effected in a manner reflecting the highest credit on the genius of the inventor. The combination of lightness with security, and the adaptation, to the utmost nicety, of the required proportionate strength to the parts, form its chief characteristics. The tension power is wholly independent of the suspension.

The bridge which was placed during the last rains over the Berai torrent, was 160 feet between the points of suspension, with a road way of nine feet, and was opened for unrestricted use, excepting heavy loaded carts. The mails and banghees passed regularly over it, and were by its means forwarded when they would otherwise have been detained for several days. The last rainy season was the most severe within the last fifty years, and yet the bridge not only continued serviceable throughout, but, on taking it to pieces, it was found in a perfect state of repair.—The bridge intended for the Caramanassa is 320 feet span between the points of suspension, with a clear width of eight feet. It is in other respects the same as the Berai torrent bridge. A six pounder passes over with ease; six horsemen also passed over together, and at a round pace, with perfect safety.

PLAN FOR PURIFYING COAL MINES FROM CHOKE-DAMP.

Sir,—In a letter which I took the liberty of adddressing to you a short time back, I stated, I could suggest a plan which would effectually purify the air in the most extensive coal mine, by expelling the carburetted hydrogen Choke-damp. I shall, as briefly and explicitlyas my smallshare of learning will enable me, explain my plan for accomplishing this most desirable object. The specific gravity of the first and the most dangerous is described as considerably lighter than atmospheric air; consequently it will always occupy the upper or highest parts of the mine; and as it is admitted that it is generated from the face of the mine (or strata of coal) on which the miners are constantly at work, these stratas of coal seldom being exactly horizontal, but generally on an inclined plane, the engine and shaft being usually at the lower end, from whence the mine is, if I may use the term, worked up hill. In this case, whether the gas is generated from the face of the mine or otherwise, still its being so far from the bottom of the shaft causes it to accumulate in this particular part of the mine, even if the roof is perfectly horizontal, but more so if there is the

least elevation. Compressed against the roof of the mine by the pressure of atmospheric air from the bottom of the shaft, the gas, like a light liquid upon one specifically heavier, will find its level. The carbonic acid gas, on the contrary, will always, if there is any descent, flow like water towards the lowest place of the mine. For these reasons I would recommend that a recess or cavity, in the form of an inverted funnel, be made in the roof or top of the mine, in the centre or highest part of the face, and that the same shall be as large as the state of the roof will admit: into this, if the same is made in the highest part of the mine, the gas will spontaneously flow. From the centre or top of this funnel, I propose that a hole, six or more inches in diameter, should be bored upwards to the surface. This may appear (because new) difficult to effect, but I have no hesitation in saying it may be effected at less than half the expense of boring downwards: in the latter, when boring to a great depth a great part of the expense is caused by the loss of time necessarily taken up in drawing up the rods to empty the auger, and to change that for the chisel. In boring upwards, the chisel only will be required, and the rods will only require to be withdrawn occasionally to repair the chisel, as the soil, &c. cut out by the chisel, will keep falling down between the rods and the outside of the hole to the bottom of the pit. The rods may easily be worked by levers and pulleys.—When a hole is completed to the surface, the gas may be easily forced to this part of the mine in the following manner:—Let a tin, copper, or sheet-iron pipe (air tight) be fixed to the nozzle of a pair of large bellows at the top of the shaft, or (if not too remote) at the engine shaft, which may be made to work the bellows when necessary; let the pipe be continued down the shaft and along the top or roof of the mine (fixed up with wooden wedges) towards the lowest part of the face of the mine; have as many branch-pipes as may be necessary, and at the end of each a stop-cock. A long leather flexible pipe or hose, such as the firemen use, with a brass or other tube attached, may be screwed alternately to the different ends of the pipe, beginning at the lowest or farthest end (from the funnel) of the face of the mine; and through this medium the air may be placed against the face of the mine as often as may be deemed necessary. Thus may the air be purified in the most remote parts of the mine, and, besides expelling this dreadful enemy of the miners, the plan will furnish, in lieu of the air contaminated by their breath, pure and refreshing atmospheric air.

If the plan of boring appears impracticable or too expensive, I would suggest another plan, nearly as efficacious. Instead of bellows, substitute an air-pump: instead of one funnel or cavity in the roof, make several along the face of the mine, into each of which conduct a pipe, with the end made similar to the broad end of a trumpet, and let the same be turned upwards to near the top of the different funnels or cavities. This will, by working the pump, draw out all the dangerous gas and contaminated air, which will be replaced by pure atmospheric air from the shaft.

If there is any remote part of the mine which requires to be explored, and where there is reason to think this dangerous gas is accumulated in a state of explosion, by adopting the following plan the same may be exploded without danger to the parties: Provide a strong box, similar in shape to a sedan chair, sufficiently capacious to contain two persons; in the centre of the hind part of the same let there be placed about six inches square of very fine wove wire, to admit air, with a slide to shut occasionally. In the front have a plate of thin crown glass, sufficiently large for the persons inside the box to see their way through; and let this also be protected with a slide outside. One of Sir Humphry Davy's patent lamps, placed on the outside of the front, over the glass, will indicate to the persons inside when they approach a part of the mine where the atmosphere is

explosive; on the discovery of which they have only to retreat backwards to a sufficient distance, and then explode the gas by means of a common serpent fired from a pistol through an aperture in the front of the box.—They may be provided with means to relight their lamp, and I presume to think they would be sufficiently shielded from the effects of the fire. I have always observed that the fatal accidents generally occur on a Monday morning. Would it not be a means of diverting the danger of an explosion, by sending down two men to try the above experiment before the whole descended? The box might be kept constantly ready at the bottom of the shaft.

A STAFFORDSHIRE FARMER.

IMPROVED AUGER.

The following account of a New Auger, invented by Dr. Church, of Birmingham, is given by the Editor of the London Journal of Arts and Sciences:—

"This improved auger (indeed we have seen several of them, of different sizes, but the most perfect one we now refer to) is one inch and one-eighth in diameter. We first tried its effects upon a piece of dry deal, four inches thick, held in the left hand, without any other support, and turning the auger by the right hand, in the way that gimlets are usually turned, passed the auger through the four inch deal in fifty seconds. With the assistance of a bow, it was made to penetrate through a post of seven inches square in twenty-one seconds, and in the hand of an expert workman, there is no doubt but that its progress would be much more rapid. It cuts a perfectly smooth hole, and clears itself as it advances.

"The utility of an auger possessing such superior advantages to shipwrights as well as a variety of other artisans, must be immediately obvious; and one circumstance which renders it still more valuable is, that its form is such, that it can be sharpened, from time to time, upon an ordinary grindstone, without in the slightest degree altering its figure; indeed, it will retain the same form and properties even though ground down to within a short distance of the stem.

"Not having the inventor's permission, we refrain from publishing a particular description of this instrument; but as soon as the specification is enrolled, which will be in May, we propose to ourselves the pleasure of presenting it to our readers in a more perfect state."

A QUESTION IN OPTICS.

SIR,—As a subject likely to excite some little consideration as well as research amongst your numerous readers, and for the purpose of deciding a controversy which has arisen between a few friends, not very capable of experimental determination, I make no apology for requesting the insertion of the following question in your Magazine.

What is the greatest distance at which the human sight under every most favourable circumstance of light and situation can see the hands and figures of an ordinary turret clock (say four feet in diameter) so as to tell the hour?

It is conjectured, that the evening, when the sun's rays may be almost reflected horozontally from the face of the clock to the spectator's eye, would be the most favourable time of the day, and that across water would be the most adventageous situation; but inasmuch as the extent of diminution of the angle under which the hands and figures are observed, by the increased distance, must be limited to the size laid down by writers on optics, as capable of exciting a sufficient image upon the retina of the eye, there must be an extent beyond which every aid, save that of a telescope, is unavailing.

If some of your inquiring readers will assist our discussion of the question, by an investigation of the foregoing principles, they will oblige their co-operator, and

Your constant Reader,

S.

ARTIFICIAL STONE.

Mr. Joseph Aspdin of Leeds, has taken out a patent for a new mode of producing an Artificial Stone or Cement for the covering of Build-

ings. He calls it Portland Cement, from its resemblance to Portland stone; its component parts are as follow:—A given quantity of limestone, of the kind usually employed for mending roads, is to be pulverized by beating or grinding, or it may be taken from the road in a pulverized state, or in the state of puddle: this, when dried, is to be calcined in a furnace in the usual way. A similar quantity of argillaceous earth or clay is then to be mixed in water with the calcined limestone, and the whole perfectly incorporated, by manual labour or by machinery, into a plastic state. This mixture is then to be placed in shallow vessels for the purpose of evaporation, and is to be submitted to the action of the air, the sun, or the heat of fire, or steam conducted by pipes or flues under the pans of evaporating vessels.

This composition, when in a dry state, is to be broken into lumps of suitable sizes, and is then to be calcined again in a furnace similar to a lime kiln, till the carbonic acid has been entirely expelled. The mixture so prepared is then to be pulverized by grinding or heating, and, when reduced to a fine powder, is in a fit state for use, and with the addition of so much water as will be sufficient to bring it into the consistency of mortar, will, when applied to its purpose, make a compact and durable artificial stone, equal to the Portland stone itself.

STRENGTH OF ROPE.

SIR,—The following is a rule for judging the weight which a rope will bear.—Multiply the circumference in inches by itself, and take the fifth part of the product, which will express the tons it will carry. Thus, if a rope has six inches circumference, 6 times 6=36÷5, which is 7 1-5 tons. Apply this to a rope of 3 1-5 on which Sir C. Knowles made his experiment: 3 1-5×3 1-5=10 5 1-5, which is 2.05 tons—4928 lbs.

It is established, that tarred cordage is weaker than white, and the difference increases by keeping.

The following experiments were made by Mons. Du Hamel, at Rochfort, on cordage of 3-inch French circumference, made of the best Riga hemp, August h 1741.

White.		Tarred.
Broke with strain of	4500 pounds	3400 pounds.
	4000	3300
	4800	3258
	August 25th, 1743.	
	4600	3500
	5000	3400
	5000	3400
	September 23rd, 1746.	
	3880	3000
	4000	2700
	4200	2800

A parcel of white and tarred cordage was taken out of a quantity which had been made February 12th, 1746. It was laid up in the magazine, and comparisons were made from time to time, as—

	White bore	Tarred bore	Difference.
1746 April 14th	2645	2312	333
1747 May 18th	2762	2155	607
1747 October 21st	2710	2050	660
1748 June 19th	2575	1752	823
1748 October 2nd	2425	1837	588
1749 Sept. 25th	2917	1865	1062

M. Du Hamel says, that it is decided by experience, that white cordage, in continual service, is one-third more durable than tarred: secondly; it retains its force much longer while kept in store; thirdly, it resists the ordinary injuries of the weather one-fourth longer.

We know one remarkable fact, that in 1758 the shrouds and stays of the sheer hulk at Portsmouth Dockyard were over-

hauled; and when the worming and the service were taken off, they were found to be of white cordage. On examining the store keeper's books, they were found to have been formerly the shrouds of the Royal William, of 100 guns, built 1716.—She was thought top heavy and unfit for sea, and unrigged, and her stores laid up. Some few years afterwards her shrouds and stays were fitted in the sheer hulk, where they remained in constant and very hard service for about thirty years, while every tarred rope has been repeatedly renewed.

The shrouds were tarred and blacked, and not known to be white rope; therefore, it appears that white rope, tarred and blacked, will resist the weather, and be much stronger.

These remarks I find in my private book, made when master on board his Majesty's ship Impregnable, of 100 guns, in 1815, but from where copied I cannot remember. As she was then employed in the Mediterranean, I think it likely the paper may have fallen in my observation there.

WM. AMEY,
Master, Royal Navy.

EXTINGUISHING FIRE.

M. Cadet Vaux, reflecting on the circumstances of a fire when it occcurs in a chimney, was led to endeavour at its extinction, by rendering the air which passes up the flue unable to support combustion. This object he obtained by the simple means of throwing flour of sulphur on the fire in the grate, and so effectual was it, that a faggot suspended in the chimney very near the top, and consequently near the external air, when set on fire and burning with great fury, was instantly extinguished on the application of the sulphur below. This process is the more applicable, inasmuch as it does not require that all the oxygen in the air should be converted into sulphurous acid gas before it passes up the chimney; on the contrary, a comparatively small proportion of the latter gas, mixed with common air, is sufficient to prevent its supporting the combustion of common combustible bodies.

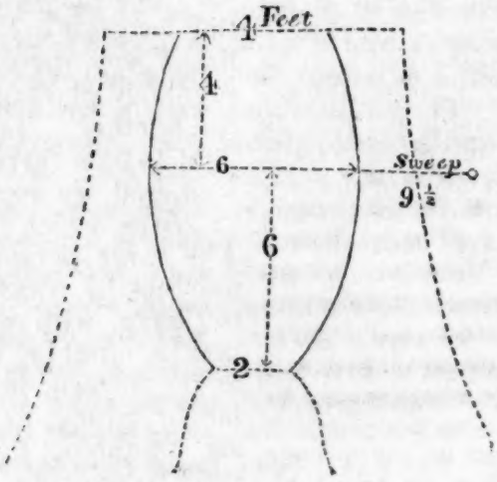
SUBSTITUTE FOR GLASS IN LANTERNS.

M. Lariviere, a mechanic at Geneva, has conceived the idea of substituting for glass in lanterns, plates of polished iron, pierced with small holes, regularly placed, and very close to one another These plates allow the light to pass through them extremely well, and are much superior to metallic wires, which are easily deranged. The same person is at work upon a machine by which he will be enabled to pierce, with regularity and expedition, a number of small holes, so as to perform in a minute, the same labour which, according to the existing methods, it would require an hour to execute. This invention will be very serviceable in the construction of seives and filtering vessels.

SIR HUMPHREY DAVY'S COPPER SHEATHING.

His Majesty's ship Samarang, of 28 guns, Captain David Dunn, arrived on the 25th of December at Portsmouth, from Halifax, after a tempestuous passage of nineteen days. "We understand (says a Portsmouth Paper) the return of the Samarang to England, after being so few months on the North American station, is occasioned by a discovery of the complete failure of Sir Humphrey Davy's experiments to preserve ships coppers from decay. The Samarang was fitted out at this port under that eminent chemist's direction, with the zinc preservers attached to the sheathing metal, by means of which, producing galvanic action, it was expected the copper would be preserved from corrosion; but it is proved, that though the oxidation of the metal is prevented by the defensive action of the iron, the animalculæ which this oxidation used to destroy now prey in such security upon the vessel, that the bottom of the Samarang is covered with worms, barnacles, and sea-weeds, to a degree which prevents her from being steered with necessary safety; she is, therefore returned to England to be docked and recoppered."

LIME BURNING.



Sir,—The above are the form and dimensions of the most approved kilns used in the north of Ireland for burning lime. I must observe, that the turf dug from the bogs in Ireland is much more solid and durable, as fuel, than any English turf I ever saw: one car load, probably about five cwt. will burn twenty bushels of lime of the finest quality, the stone being very hard and compact, and of that species found in primitive mountains, of gneiss and mica slate, some of which is perfect marble, and most of it making a near approach to that state. The stone is broken so small that no piece is left more than about one inch thick; thus the carbonic acid gas of this compact stone has only to be driven off by the heat of the fire from a depth within each piece of half an inch. As it requires one-third, by measure of coal, to convert any quantity of limestone into lime, and as a bushel of coal weighs about 83lbs., it appears that nearly the same weight of turf as of coal is required to burn lime; and hence your Cosrespondent will probably find, that a similar *weight* of the combustibles he enumerates will be necessary for this purpose. To economise heat, the Irish kiln is kept constantly burning, by supplying peat and limestone in due proportion at the top, as the mass sinks down, and the lime is taken out below. The very light materials S. F. enumerates may, probably, without some care, burn away too rapidly to produce the proper effect. I cannot give him any positive information on this point. I would suggest, however, that as the combustion may be totally extinguished by cutting off the supply of air at the bottom of the kiln, the heat may surely be regulated by the partial admission of it.—If this should be found upon trial to act partially and irregularly, perhaps balls made up with loam and heathy sward beat up together may answer. I conceive S. F's kiln should be constructed, externally, of what he calls limestone-grit, and lined with bricks set in brickmaker's loam. The whole ought not to cost more than 15*l.*

G. C.

Brompton.

LEATHER BANDS.

To the Editors of the American Mechanics' Magazine.

In your 14th Number is an article on the subject of Leather Bands, in which reference is made to a band applied by us to propel a saw; and the impression conveyed is, that the application to this object was original with us. Being indebted for the improvement to the enterprise and research of others, it is incumbent on

us to correct the statement of your Correspondent in this particular.

For several years past, bands have been commonly used, for a similar purpose, in mills for cutting mahogany; and in two instances within our knowledge were satisfactorily applied to ordinary sawing They have also been in use connected with other parts of the machinery of a saw-mill. At the mill of Nathan & David Sellers, in Delaware County, Pennsylvania, constructed to saw Veneers, a belt was applied more than twenty-five years ago to propel the saw. This, we have no doubt, was the first mill at which the power was so conveyed for such a purpose.

The mill, in which the band, one foot wide, mentioned by your Correspondent, is employed, belongs to one of our firm, and is probably the first *Belt Mill* erected to cut long ship plank, and other large and heavy timbers; but sufficient evidence had been previously afforded of the strength and capacity of leather bands to warrant their employment on the most extended scale. The width of the band was predicated on the employment of two saws, which the mill, when completed, is intended to drive. A well constructed belt, eight inches wide, is altogether adequate to drive a single saw. One of that size, applied to an object requiring at least equal strength with a saw belt, is used in connexion with the machinery for drawing the logs from the water, up a considerably inclined plane, to the platform of the mill; and a smaller one is used for the purpose of running the log carriage back.

From the experience we have had on the subject, we cheerfully concur with your Correspondent in recommending a more extensive use of leather bands in machinery than at present obtains. We may add to the reasons assigned by him, that the machinery itself may frequently be more conveniently arranged by using them. It may also be observed, that when a cogged wheel is thrown *into gear* with another which is in motion, an unpleasant jarring is produced, often injurious to the works, which is entirely obviated by substituting bands for effecting the same purpose of bringing a part of the machine into occasional operation.

We are inclined to believe that there is less friction in the use of bands than of cogged-wheels. On this subject we have contemplated making a series of experiments, the result of which, when prepared to do so, we shall offer to your notice. We are not at present aware of any rule for determining the question, without recourse to actual and careful experiment.

In the construction of leather bands the firmest parts of the leather should only be used, and when cut into pieces of nearly a suitable width, they should be stretched as much as possible previous to trimming the edges or making them up In preparing the bands made by us, the operation of stretching was performed by a machine constructed for the purpose, and instead of forming the joinings by sewing them with thread or leather thongs, as was customary, the use of rivets and burrs, such as are employed in hose, were substituted. The ends of the strap were also attached by small flat-headed bolts and nuts, instead of tying or making use of buckles for that purpose; by this process the only serious objections to leather bands were fully obviated.

SELLERS & PENNOCK.

Philadelphia, 5th Month 23, 1825.

SHARPENING PENKNIVES.

SIR,—I have perceived in one of your Numbers an inquiry as to the mode of sharpening Penknives, which is very well answered in another place. Whether knives, razors, or any other species of edge tool, be to be sharpened, it will be found a great addition to the speed of the operation, and to the keenness of the edge, to sprinkle a little *crocus Martis* upon the stone, together with the oil or other fluid.

I am, Sir,

Your obedient servant,

M.

ANCIENT TYRIAN PURPLE DYE.

The purple was the only one in use in ancient times for the splendid robes of kings and princes. It was extracted from a species of shell fish. The body of the fish was crossed by a very white vein, containing the precious blood, which imparted to wool and silk the brilliant dye This blood, with the vein was boiled in leaden—some say in tin vessels (which were previously wetted with water) and from this fluid, by some process, now unknown, two different dyes were procured; one between red and black, or what we would call a clove colour—the other what we call carnation, but what the ancients called purple. This, it has been suggested, was only used for woollen, or linen, or cotton; and that crimson silks were not produced before the introduction of cochineal, after the discovery of America of which cochineal insects is a native.

Modern naturalists describe many purple fish which give out a purple-coloured liquor; but the art of fixing the dye is lost. In 1684, the purple fish were discovered in great abundance on the coast of Somersetshire, and which seems to agree in many essential points with those on the coast of Phœnicia and which produced the Tyrian purple. M. Du Hamel, in a paper printed in 1736, in the "Memoirs" of the French Academy, says, that the blood which remains in the body of a healthy animal is wholly white, but no sooner is it exposed to the sun, than it begins to change colour, and in less than five minutes goes through the several changes of pale green or yellowish, and a beautiful emerald green; after this it becomes of a deeper or duskier green, then bluish reddish, and finally a deep and very beautiful purple—Du Hamel dyed some pieces of woollen and linen cloth with this liquid, and which retained their brilliancy of colour after being boiled in different liquids The dye was, however, found to be too viscid, which prevented its penetrating easily into the cloths: but it is probable the Tyrians had a method of dissolving the fluid.

Mr. Parkes, in his Essay on Calico Printing, seems inclined to believe that the Phœnicians, or, at all events, the ancient inhabitants of India, used cochineal; and so great was the demand for cloth of the celebrated purple colour that the city of Tyre grew to a vast extent, from the number of workmen employed in its manufacture This is, however, at variance with history, and with another statement of his own, where he says,—"Such was the purple of the ancients, which none but the *Cesars* were allowed to wear. At the taking of Susa, Alexander the Great found in the Royal Treasury purple to the value of fifty thousand talents, which had lain there 192 years, and still retained its exquisite beauty." The cochineal which Mr. Parkes speaks of must have been the *kermes*, (for there evidently were *two* purples of very different price) which was used by dyers to produce the European scarlet before the introduction of cochineal from America.

QUANTITIES OF WATER USED IN PARIS, LONDON, ROME, AND CONSTANTINOPLE.

According to Frontinus, who had the charge of the aqueducts under the Emperor Nerva, the nine main aqueducts in his time delivered every day about twenty-seven million eight hundred thousand cubic feet; and when all the aqueducts were in action, we may extend the quantity to fifty millions of cubic feet of water daily. Reckoning the population of ancient Rome at a million of souls, this would give us fifty cubic feet for the daily supply of each inhabitant—about three hundred wine gallons each.

In modern Rome, which contains only one hundred and thirty thousand inhabitants, it is computed that about five millions and one third of cubic feet are expended—nearly equal to forty cubic feet for each individual, or two hundred and forty and a half wine gallons.

In 1790, the supply of London was stated at two millions and three-quarters of cubic feet; and now it may probably amount to about four

millions, from the rivalship of the companies. This will not give more than three and a half cubic feet to each inhabitant, or about twenty-one wine gallons.

The population of Paris is estimated at six hundred thousand souls, and the supply is not more than three hundred thousand cubic feet daily This will give about half a cubic foot, or three wine gallons for the use of ach Parisan.

In Constantinople, with a population of six hundred thousand, each inhabitant may be said to have two-thirds of a cubic foot of water or about six gallons —a very small quantity, when we take into account the frequent ablutions which are enjoined to be be performed by the Mahometan religion.

In Paris, in Rome, and Constantinople, a large proportion of the supply is farther wasted in the public fountains, and which was also the case in ancient Rome; yet, if we allow only a fourth part of the supply stated by Frontinus to be used for private purposes, this quantity, when compared with the wants of the most luxurious modern population, will be enormous; for even from the miserable supply of Paris a great deduction must be made from the average quantity allowed to each individual, for the quantity flowing from the numerous public fountains in that city —In London this is saved; and the whole quantity, or nearly all, may be fairly considered as consumed by its mass of inhabitants for domestic purposes.

SQUARING THE CIRCLE.

SIR,—After so much has appeared in your valuable Journal respecting "Squaring the Circle," I feel that some apology is due for trespassing on your readers with a few farther observations on the subject.

Several of your intelligent Correspondents have sufficiently demonstrated, that a method of squaring the circle geometrically still is, and probably must ever remain, a desideratum in mathematics. But I have not observed that any one has attempted to show how nearly this may be effectected mechanically; and, therefore, the information, which it is the purpose of this letter to convey, may possibly be new, as well as useful, to some of your readers. It is hardly necessary to premise, that the object is to construct a square, the area of which shall be equal to the area of a given circle, and the length of the side of which shall be expressed in parts of the diameter, or of the radius of that circle. The nearest whole numbers by which this can be effected are, probably, 8 and 9; that is, if the diameter of the given circle be divided into nine parts, the side of the square which shall nearly equal it in area, must be eight of those parts. This will rather exceed the truth; and it is impossible to do it exactly, although the error may be reduced to a less quantity than any that can be assigned For instance, a still closer approximation may be derived from dividing the diameter of the circle into 360 parts; then shall the side of the square equal 319.041659, &c. of those parts, nearly. The square of this number will be rather less than the area of the circle, and the square of 319.041867 will exceed it; but these numbers do not differ till we come to the ten-thousandth place of the decimals, and then only by 2; therefore the first number is within 2-10,000th parts of the truth; and it may be seen, by inspection, that the ratio of the numbers to each other is nearly as 8 to 9.

It is evident that there are no limits to this approximation; but the above will probably be found sufficiently near the truth for all mechanical purposes.

N.

ON PURIFYING ANIMAL CHARCOAL FOR THE USE OF VINEGAR MAKERS, &c.

Large quantities of animal charcoal are now used by vinegar-makers, *without any kind of preparation*, for the purification of vinegar; and they are not at all sensible of the great loss to which they are exposed from such practice.

All animal charcoal, as prepared from bones, for the purposes of commerce, contains a considerable quantity of undecomposed carbonate of lime. When vinegar is added thereto, a brisk effervescence ensues, and *a very large proportion of vinegar* combines with the lime, expelling the carbonic acid, forming acetate of lime; thereby depriving the vinegar of its strength, and occasioning a very material loss to the manufacturer.

Animal charcoal, therefore, previously to its being used for the purpose of purifying vinegar, should be freed from carbonate of lime, and all the metallic matters which it may contain, by a weak solution of muriatic acid.

When all effervescence has ceased, after adding this acid to the charcoal, the acid should be allowed to remain upon it a few hours, and then be poured off. The charcoal must then be well washed in water several times: and when dried, it is fit for the manufactcrer.

COCHINEAL.

Mr. Bruce, in his Travels to discover the Source of the Nile, thinks that the process of getting the purple dye from a fish was a fable invented by the Tyrians to conceal their knowledge of cochineal; "for (says he) if the whole city of Tyre had applied to nothing else but fishing, they could not have coloured twenty yards in a year." There is, however, a shell-fish found in great abundance near Hastings, in Sussex, which dyes a very permanent purple. An eminent modern chemist says that he has given a stain or dye to calico with it, that no washing or exposure to the sun and weather has removed.

ON ROMAN MILL STONES.

SIR.—Having observed a plate of the ancient Roman corn mill, the figure reminds me of two specimens, dug out of the earth, about the years 1808 and 1810, in the parish of Llan gireg, county of Montgomery, North Wales.

Besides, there is mention of others, by the Rev. Theophilus Evans, of Llangamarch, Brecnockshire, South Wales in his valuable Welsh work, called Drych y Prifoesoedd; he said that there were mills with the ancient Welsh, called y glicien wisgi, meaning a mill going its revolutions with wonderful velocity and a clacking noise. Those that I have seen were found by those people that cut turf for their fire instead of coal. Near the same neighbourhood I was cutting of turf, and found a specimen, about 2 1-2 feet in diameter, resembling the present mill stones for shape; but it was a stone of the neighbourhood, and not foreign, being the lower stone; and about a dozen years before then, the upper stone was found, at about ten yards distance from the lower one, and about nine feet from the surface. My conjecture was, that they were lost in time of war and destruction Should such things be collected together into some museum, they might benefit history, and make it more valuable.

No more at present.

T. MORGAN.

Communications for the American Mechanics' Magazine,

Post paid, and addressed to

JAMES V. SEAMAN,

Broadway, New-York, will receive due attention.

William Van Norden, Printer.